

Description of a New Species of Carollia and Remarks on Carollia brevicauda.

By Harrison Allen.

(Read before the American Philosophical Society, December 6, 1889.)

Carollia is one of the most common of the South American leaf-nosed bats. Notwithstanding its wide range of distribution (it is found from Mexico to the southern limit of Brazil, including the Antilles), the type of the genus is that of the single species also. I have recently examined this form—*Carollia brevicauda*—with the object in view of determining whether or not an example of *Carollia* in the collections of the National Museum might prove to be new.

The facts which led me to suppose that this might be the case were the following :

The specimen was smaller than *C. brevicauda*, the color was of a light chestnut brown tint, instead of the ashy shade of *C. brevicauda*. The interfemoral membrane was not incised. The nose-leaf was relatively small, delicate, with entire, rounded nostrils, and the lower border sharply defined to a point near the median line, where a small naked space alone was seen.

I have had a knowledge of these facts for a long time, but I hesitated to describe the form as new, for in general appearance in the proportions of the membrane, in the form of the ear, in the markings of the wing membranes and the shapes of the terminal phalanges, the two forms appeared to be essentially the same. I had but a single specimen—a young male from Costa Rica. I concluded that before describing it an examination of all the specimens of *Carollia* should be made. A large number of specimens of the genus were available for the purpose from the collections of the Museum of Comparative Zoölogy, but unfortunately nine only of the twenty-six examples were in good condition.

From among these a young male was found, and I was thus able to show that the smaller size of the specimen, as well as the difference of coloration of the new form, as compared with the old, were not due to age.*

As a result of this examination, I venture to describe the single example as a type of a new species in the following language :

CAROLLIA CASTANEA, n. sp.

Smaller than *C. brevicauda*. Fur long and silky. Above, lustrous light chestnut brown at basal one-half and at the tip. The intervening portion is yellow brown (old gold). Below, the same colors prevail, excepting that over the abdomen and pubis the brownish tip is absent and the body of the hair not golden. There is no hair on the forearm (the parts are slightly



*The teeth were all erupted, the epiphyses of the radii, metacarpals and phalanges were united to their shafts, but the tibia was slightly flexible and the foot was covered by a looser skin than is seen in matured individuals. It is not always easy to determine the age of bats.

rubbed), and scarcely any on the dorsum of the metacarpal bone of the thumb. The distribution of the hair on the wing membrane is as in *C. brevicauda*.*

The general form of the auricle as in *C. brevicauda*, but is proportionately longer. The outer border is more emarginate. When the auricle is laid on the head, it reaches a point as far as the end of the muzzle. The tragus is obscurely acuminate; the inner border, therefore, not straight, but the apical half abruptly narrowed. The outer border crenulate, rather than pectinate. The basal lobe and the process above it well developed. The nose-leaf is more delicate than in *C. brevicauda*. The height is 7 mm.; the breadth $4\frac{1}{2}$ mm. The lower border is much more distinct than in *C. brevicauda*. The nostrils are rounded, well defined, and not continuous with a concavity on the outer border.† The warts on the mentum are arranged in three obscurely disposed rows, the middle one being the larger, but none of them are elongate. The tail reaches to a point opposite the knee.

Skull. The general proportions of the skull are the same in the two species. The brain case at the procephalon is inflated and the temporal crest does not extend over the inflated part. Hence the impressions for the temporal muscles are not defined on the frontal bone. The upper border of the anterior nasal aperture is on a line with the canine tooth. The distance between the lachrymal ridges is greater than between the lachrymal ridge of one side and the corresponding central incisor. The distance from the last maxillary molar to the posterior limit of the nasal chamber is less than the distance from the point last named to the end of the long endopterygoids. The palatal rugæ are more trenchant, curved and wider apart opposite the premolars, than is the case with *C. brevicauda*.

Teeth. The number of the teeth is the same as in *C. brevicauda*, viz.:

$$\frac{2}{2} - \frac{1}{1} - \frac{2}{2} - \frac{3}{3} \times 2 = \frac{16}{16} = 32$$

The maxillary central incisors touch their entire lengths.‡ The lateral

* The fur of *C. brevicauda* is described as follows:

Above, moderately long only. The base is plumbeous, the tip brown, and the intermediate part pallid—almost white. Below, the fur is short, plumbeous at basal half, and of the peculiar mouse gray so often seen in Phyllostomidæ. G. E. Dobson (Cat. Chir. Br. Mus., 1878) describes the fur as brown above and beneath. None of the nine specimens examined were so marked. The brown aspect of the animal as seen in spirit is much more apparent than when dried. The nose-leaf is covered with fine short hairs on both sides. The back of the thumbs is densely covered with short hair in *C. brevicauda*.

† The nostrils are oval in outline, are not separable from the outline of the nose-leaf above, and are continuous with a concavity (as one speaks of a mouth of a pitcher being concave), on the outer border. The peculiarity just named is best seen by holding the specimen so as to keep the vertex of the head upward, the observer looking downward from the tip to the base of the nose-leaf.

‡ G. E. Dobson (Cat. Chir. Br. Mus., 1878) gives this as a character of *C. brevicauda*. From my examinations, I cannot agree with this writer. The teeth exhibit a A-shaped space between the cutting edges.

incisors are very small and are free from both the central incisor and the canine. The first premolar is distinctly caniniform and does not touch either the canine or the second premolar.

The mandibular second premolar does not touch the third premolar. The distance from the anterior border of the canine to the first molar is 3 mm., a distance over $\frac{1}{2}$ mm. greater than that from the anterior border of the canine to the central incisors.

	<i>Measurements.</i>	<i>mm.</i>
Head and body (from crown of head to base of tail).....		44
Length of arm.....		25
" forearm.....		32
First digit.....	{ Length of first metacarpal bone.....	4
	" first phalanx.....	6
Second digit...	{ Length of second metacarpal bone....	26
	" first phalanx.....	3
Third digit....	{ Length of third metacarpal bone.....	32
	" first phalanx.....	16
	" second phalanx.....	20
	" third phalanx.....	10
Fourth digit...	{ Length of fourth metacarpal bone.....	30
	" first phalanx.....	13
	" second phalanx.....	11
Fifth digit.....	{ Length of fifth metacarpal bone.....	32
	" first phalanx.....	11
	" second phalanx.....	10
Length of head.....		15
Height of ear.....		15
" tragus.....		6
Length of thigh.....		11
" tibia.....		13
" foot.....		10
" interfemoral membrane.....		15
" tail.....		8

Costa Rica. Collections of National Museum. Collected by J. C. Zeldon.

The nine specimens of *C. brevicauda*, which formed the basis of my study, were chiefly interesting from the measurements which were made of the peripheral parts. These are arranged in tabular form (p. 22).

TABLE OF MEASUREMENTS OF CAROLLIA BREVICAUDA.

	3097 ♀	3129 ♀	3128 ♀	3231 ♀	3098 ♀	3093 ♀	3250 ♂	3229 ♂	4192 ♂	12,914 ♂
	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
Arm*	26	26	28	25	25	26	27	25	25	
Forearm†	37	39	40	37	38	38	39	35	32	
I { Metacarpal	5	5	5	4	6	5	5	5	4	
1st phalanx	4	5	5	4	4	5	4½	4	3	
II { Metacarpal	24	30	30	27	30	31	31	28	26	
1st phalanx	3½	5	4	4	3	3	4	3½	3	
Metacarpal	34	37	36	35	35	37	36	35	32	
1st phalanx	13	17	17	14	14	16½	17	16	16	
III { 2d phalanx	21	22	22	21½	20	22	21	18	21	
3d phalanx	11	11	11	11	11	11	10½	11	10	
Metacarpal	32	36	36	35	34	34	34	34	30	
IV { 1st phalanx	13	13	13	11	13	13	14	12½	13	
2d phalanx	14	12½	12½	10½	13	12	13	11	12	
Metacarpal	36	37½	37½	35	35	36	36	35	32	
V { 1st phalanx	11	12	12	12	12	12	12	11	12	
2d phalanx	11	11	11	11	11	12	10½	10	11	
Femur	14	14	15	12	13	14	14	12	12	
Tibia	14	14	17	16	15	15	18	14	13	
Foot	11	11	11	11	11	11	11	11	10	
Tail	7½	7	6	6	7½	7	7	7	8	
Head	22	22½	24	22	22	23	22½	23	20½	
Auricle‡	12	13	13	13	12	13½	12	12	12	
Tragus§	6	6	6	6½	6	6	6	6	6	
Width of 2d digital interspace	6	4	5	5	4½	6	6	5	4	
Width of 3d digital interspace	22	16	20	21	23	21	19	20	21	
Width of 4th digital interspace	31	28	32	31	35	35	26	27	30	

*From top of shoulder to epicondyle.

†From epicondyle to end of radius.

‡From outer border posteriorly.

§Outer border.

With the exception of the foot, which is constantly 11 mm. long, all the measurements are subject to variation—indeed, no two specimens in all respects are alike. This statement is made while making due allowance for the difficulty in taking some of the measurements, as for example those of the thigh and of the membranous expansions. Specimens which had been macerated in weak alcohol were rejected. But among those which were accepted it was not always possible to determine (owing to the contraction of the tissues), the exact extent to which the parts should be extended, so as to represent as far as possible the position of the wings in flight. One of the most interesting measurements is that of the width of the third digital interspace. This space, so small in Pteropidæ, Molossi, and in Noctilio, is wide in Phyllostomidæ, excepting Phyllostoma. Another interesting feature is the extent of the incision on the free margin of the interfemoral membrane. In well-preserved specimens of *C. brevicauda* the incision is conspicuous, while in the type of *C. castanea*, which is also in good condition, the incision is absent. Yet in slightly macerated specimens of *C. brevicauda* the incision disappears, showing that it is a character which is dependent upon tonicity and not on any distinctive structural peculiarities, and cannot, therefore, have much value. One of the marked ranges of measurements is seen in the length of the tail. The shortest tail is 5 mm. long and the longest 7 mm. The tip of the tail answered in three specimens to the middle of the femur, in four to the junction of the middle with the lower third, and in two lack one-fifth only in being as long as the femur. In none, therefore, was the tail as long as in the single example of *C. castanea*.

The length of the thigh varies from 12 mm. to 15 mm. Hence the relative lengths of these quantities will be also variable, especially so since even in the same individual the length of the tail does not tautogenize* with the length of the femur. The length of the tibia—a character of value in Cheiroptera—varies from 14 mm. to 18 mm.

The length of the forearm, perhaps the most important single measurement which can be taken, varies from 35 mm. to 40 mm.

The following includes the variations of the manus and their range :

	mm.	mm.	mm.
First metacarpal.	from 4	to 6	Range 2
Second "	" 24	" 35	" 9
Third "	" 33	" 37	" 4
Fourth "	" 32	" 36	" 4
Fifth "	" 35	" 37½	" 2½
First phalanx first digit.	" 4	" 6	" 2
†First " second "	" 3	" 6	" 3
First " third "	" 13	" 17	" 4

* Tautogenity—a word introduced by Prof. Rolleston as a more correct term in this connection than correlation.

† An apparent anomaly exists on the left side of specimen No. 3993. There are two phalanges to the second digit.

			mm.	mm.	mm.
First phalanx fourth digit.....		from	11	to	14
					Range
First " fifth "		"	10	"	12
Second " third "		"	20	"	21½
Second " fourth "		"	10½	"	14
Second " fifth "		"	10	"	12
Third " third "		"	10	"	11
					3
					2
					1½
					4½
					2
					1

The length of the head appears to be subject to very slight variation, namely, from 22 mm. to 23 mm. That of the ear, from 12 mm. to 13½ mm., a slight difference and yet one which might disturb the novice in attempting to identify the species, since the proportion between the height of the ear and the length of the muzzle is so often used in descriptions of bats. In *Carollia* these quantities are not fixed. The height of the auricle is variable, but the length of the muzzle is constant. No estimate of relations of measurements between them can be undertaken.

The tragus varies in height from 5 mm. to 6 mm. It presents different degrees of thickness along the median border. As a rule, very thick, this border may be thin and membranous. The processes on the outer border may be two or five, those toward the apex of the tragus tending to merge in one another. This tendency appears to be most marked in males.

The size of the nose-leaf is constant, being 10 mm. high and 6 mm. broad. The lower border shows striking peculiarities in some specimens.

Three of the males exhibited warts arranged in one or two rows across the upper lip on the line occupied in *Artibeus*, *Phyllostoma*, etc., with a well defined ridge or border. This variation is one of generic rather than specific value. At least it does not indicate any disposition to reversion to *C. castanea*, since in this species no warts are seen, the intervals between the margins of membrane at the side of the base of the nose-leaf simply being smaller than usual, and giving to the eye the appearance of extending directly across the lip. I know of no genus in which this variation of the nose-leaf of *Carollia brevicauda* is a constant character.

In *C. brevicauda*, the warts in the second row on the mentum are elongate in all the nine examples, except one in which they are rounded and do not differ from those of the first row. This arrangement resembles that seen in *C. castanea*.

It is probable that the two outermost rows of warts in *C. brevicauda* coalesce to form the elongate wart, which, as a rule, exists.

In reviewing the measurements of *C. castanea*, when placed in tabular form with those of *C. brevicauda*, it is seen that in the species first named that many of the measurements are the same; that is to say, in some one of the examples of *C. brevicauda* the measurement of a given part will be found to be the same as in *C. castanea*. Thus the arm is of the same length in three specimens of *C. brevicauda*. The length of the bones of the digits and their complements in *C. brevicauda*, excepting the metacarpals of the fourth and fifth digits, which are shorter than in any example

of that species. The metacarpal of the first digit is of the same length in one specimen of *C. brevicauda*, while the first phalanx is shorter than in any. The head is shorter while the ear is longer. The tragus remains the same in the two species. The thigh and the leg are both shorter in *C. castanea*, while the tail is absolutely longer by 1 mm.

The proportion of the widths of the second, third and fourth interdigital spaces is shown to be subject to variation. Specimens numbered 3129, 3231, 3128, 3230, 3229, and 4192 are of those in the best condition; and it is seen that the differences are less than in the remaining specimens. But after all possible sources of error are eliminated, it will be seen that in three only of *C. brevicauda* (the males, Nos. 3230, 3229, 4192—and thus suggestive of sexual distinction) is the difference between the widths of the second and third spaces less than 10 mm., while in the single example of *C. castanea* (also a male), the difference amounts to but 9 mm.

In this connection I may allude to the value which attaches to the last-named measurements in the study of the Cheiroptera.

If a specimen of a bat, which is preserved in spirit, is so held in the hand that the wing is supported in the position of flight, it will be seen that the intervals between the metacarpal bones hold a definite relation to each other.

The width of the spaces between the metacarpals, now being recorded (the measurements are taken at their widest parts), it will be seen that the second interspace is the narrowest and the fourth the widest. In this way a formula may be stated. It is proper to add the length of the forearm to the formula, since this measurement is one of relative constancy and is of importance in framing the diagnosis of the species.

Examination of the table herewith presented exhibits at a glance the marked contrasts which obtain in the Phyllostomidæ in the composition of this formula.

It is especially interesting to note the difference which exists between the widths of the second and the third interspaces. It will be observed that no two formulæ are alike, nor is any fixed ratio preserved between the formulæ of genera which are allied. Nevertheless the measurements are sufficiently distinctive to warrant the recommendation that they be taken in all discriminating studies, not only of the Phyllostomidæ, but of the entire order.

Formulæ of the Widths of Second, Third and Fourth Interspaces in the Genera of Phyllostomidæ.

	II	III	IV	Forearm.	Differ'e bet. III & IV
	mm.	mm.	mm.	mm.	mm.
Lophostoma	7	17	18	49	1
Schizostoma	3	16	21	32	5
Macrotus	2	15	22	44	7
Desmodus	2	21	37	53	10
Vampyrops	3	17	27	36	10

	II	III	IV	Forearm.	Differ'e bet. III & IV
	mm.	mm.	mm.	mm.	mm.
Sturnira	3	21	31	38	10
Chilonycteris	1½	15	17	40	12
Carollia	5	20	32	26	9-12
Vampyrus	16	41	53	105	12
Lonchoglossa	3	19	32	53	12
Monophyllus	3	17	34	32	14
Artibeus	4	21	39	51	18
Brachyphylla	3	25	43	64	18
Mormoops	3	16	35	50	19
Phyllostoma	4	29	62	81	45

The study of measurements has given valuable results in the study of the human cranium and has enabled anatomists to come to definite conclusions respecting the validity of characters even when derived from scanty and imperfect material.

No reason can be urged why similar methods may not prove acceptable in describing a new species of mammal.

Extended observations on a number of examples of allied species enhance the value of those upon which it is proposed to announce a new one.

The following table includes the formulæ in families other than the Phyllostomidæ:

Rhynchonycteris	5	16	25	40	9
Cynopterus marginatus	10	18	27	58	9
Vespertillo murinus	2	11	31	59	10
Epomophorus franqueti	13	21	39	83	11
Rhinopoma	3	13	30	64	17
Atalapha	½	9	26	37	15
Molossus rufus	½	5	35	46	30
Noctillo	2	13	58	83	45
Pteropus edwardsii	18	17	69	145	52

Stated Meeting, January 3, 1890.

Present, 10 members.

President, Mr. FRALEY, in the Chair.

Correspondence was submitted as follows:

Letters acknowledging election to membership from Mr. A. Sydney Biddle and Dr. George Friebs, Philadelphia; Dr. C. C. Abbott, Trenton, N. J.; Rt. Rev. John J. Keane and Hon.